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Truck Crop Production Practices

BERRIEN AND VAN BUREN COUNTIES, MICHIGAN, 1959

Labor, Power, and Materials, by Operation

Farm Production Economics Division
Economic Research Service
U. S. Department of Agriculture

ACKNOWLEDGMENTS

The author gratefully acknowledges the contributions of many individuals: The farm operators whose cooperation in providing statistical material made this study possible; Harvey Belter, Extension Agent--Horticulture, stationed at St. Joseph, Mich., and A. Robert Earl, Van Buren County Extension Director, Paw Paw, Mich., Michigan State Cooperative Extension Service, and R. W. Hecht, Agricultural Economist, Farm Production Economics Division, U. S. Department of Agriculture, for their suggestions and criticisms. Personnel in the U. S. Department of Agriculture who aided in planning the study and served as advisers were O. J. Scoville, (formerly with the Staff Economists Group, Agricultural Economics), and M. L. Upchurch and R. W. Hecht, Farm Production Economics Division, Economic Research Service.

Crossley S-D Surveys, Inc., New York, N. Y., prepared the sample, conducted the field interviewing, and tabulated the statistical data under a contract with the U. S. Department of Agriculture.

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Previous publications in this group of reports on 1959 truck crop production practices covered the following areas:

Publication No.	Area Covered
ARS 43-132	Columbia County, Wis.
ERS-45	Accomack and Northampton Counties, Va.
ERS-79	Broward and Palm Beach Counties, Fla.
ERS-82	Colquitt County, Ga.
ERS-115	Cameron and Hidalgo Counties, Tex.
ERS-128	Imperial County, Calif.
ERS-129	Monterey County, Calif.
ERS-166	San Joaquin County, Calif.
ERS-169	Marion County, Oreg.
ERS-172	Yakima County, Wash.

Washington, D. C. January 1965

HOW TO USE THE DATA

Different kinds of data are needed for different purposes. Some persons have need for data on average labor, power, and material inputs, while others, particularly county agents and farm budgeters, prefer data for usual or typical labor, power, and material inputs. The data in this report are presented in such a way as to satisfy both these needs.

Tables 1 and 2 contain information on the characteristics of farms in the sample. The remaining tables are for specific crops. There are four tables and a chart for each crop. These four sets of tables are not numbered in the usual way but are designated by the letters A, B, C, and D.

The tables lettered A present quantities and costs of materials used and of contract work hired per acre. Cost items included are direct costs only; they do not include charges for such items as land, overhead labor, and capital. Data that present only direct costs are somewhat limited in use. They are applicable in computing costs incurred in connection with crop insurance programs and are useful in partial farm budgeting to compare costs of producing alternative crops when charges for overhead labor, machinery, land, and so on, are the same for either crop and, hence, need not be taken into account.

These data are not appropriate and would be misleading for use as the sole criteria in judging whether or not a farmer made a profit on a crop or whether he should stay in business, or in making cost comparisons with crops grown in other areas. For these purposes, total costs are required.

Tables designated B present the various operations performed on the crops, the most common size of equipment used, the average number of times the operation was performed, the acreage covered, the man and power inputs per acre, and the total labor and power used per acre. These data do not reflect an accurate picture of operations or inputs on any one farm; they are averages of all operations and inputs.

Tables designated C present usual or typical labor and power inputs by operation. The accompanying charts show the seasonality of the operation by periods.

Tables designated D present for each operation the composition of the work force by major sources of workers.

Data in these tables were obtained from a sample of growers and are subject to sampling error. For some crops, particularly those having limited numbers of observations, large sampling errors are possible. Therefore, these data should be considered as approximations.

Tables A, B, and D are offered for those persons interested in average requirements. However, extension economists, county agents, farm budgeters, and others may have more use for the data on usual or typical situations shown in table C for each crop.

Farm labor placement officials and others concerned with the problem of obtaining and placing workers may find tables B and D and the charts of value in determining the number of workers necessary for each operation, and the period of time during which local seasonal workers and those from other areas will be needed to supplement the regular farm labor force.

TRUCK CROP PRODUCTION PRACTICES
BERRIEN AND VAN BUREN COUNTIES, MICHIGAN

Labor, Power, and Materials, by Operation

By

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INTRODUCTION

In 1963 U. S. production of truck crops for fresh market and processing occupied 3.3 million acres of cropland. These crops used slightly more than 1 percent of the total cropland. The farm value of truck crops harvested for sale exceeded $1.2 billion, or an average of $361 per acre harvested. 1/

Although the total acreage of truck crops is small, it is highly concentrated in areas with conditions favorable for production of these crops. The major areas are in California, Florida, Texas, the Eastern Seaboard from Georgia to Long Island, N. Y., the States bordering the Great Lakes, and the Pacific Northwest.

Truck crops in general require intensive labor. These requirements are highly seasonal — with several labor peaks — the highest occurring at harvesttime.

Most truck-crop operations other than land preparation are difficult to mechanize. Thinning and weeding are two preharvest operations still performed largely by hand labor. Harvesting of a majority of truck crops is still predominantly a hand operation. Most of these crops require repetitive pickings, which must be timely, as quality deteriorates very rapidly if the crops are not harvested at the optimum time.

These high labor demands have been difficult to meet, particularly during peak periods of weeding, thinning, and harvesting. Most truck-crop areas do not have sufficient local labor available to handle the crops during these periods. This has led many thousands of workers to migrate from one area to another during the peak seasons. In addition, many thousands of foreign workers are imported annually to help satisfy these heavy seasonal labor demands.

1/ U. S. Department of Agriculture Crop Reporting Board. Vegetables — Fresh Market 1963 Annual Summary — Acreage, Production, and Value of Principal Commercial Crops. Vg. 2-2-(63).

U. S. Department of Agriculture Crop Reporting Board. Vegetables — Processing 1963 Annual Summary — Acreage, Production, and Value of Principal Commercial Crops. Vg. 3-2-(63).

Purchased inputs comprise a high proportion of the total inputs in the production of these crops. Most labor is hired. Fertilizer, seed, pesticides, and containers are significant items that are usually purchased. From 1953 to 1963, prices of these inputs increased relative to prices received for truck crops.

To gain further knowledge of some of the inputs involved in production of vegetables, information regarding the 1958-59 crop was obtained from 2,496 vegetable growers in 12 areas. 2/ The areas sampled were the counties of (1) Erie, N. Y., (2) Accomack and Northampton, Va., (3) Colquitt, Ga., (4) Broward and Palm Beach, Fla., (5) Cameron and Hidalgo, Tex., (6) Berrien and Van Buren, Mich., (7) Columbia, Wis., (8) Yakima, Wash., (9) Marion, Oreg., (10) Imperial, Calif., (11) Monterey, Calif., and (12) San Joaquin, Calif.

The areas included in the survey were selected on the basis of importance of seasonal and overall production, diversity of crops grown — both for fresh market and for processing — and number and proportion of farmers harvesting truck crops for sale. 3/

The survey population was defined as all farmers producing truck crops for sale whose farm headquarters were located within the survey area, except those residing outside the county and more than 20 road miles from their headquarters in the survey area. Within the survey area, a randomized area sampling plan was used to obtain the desired number of respondents.

This is the 11th in a group of 12 publications containing information on labor requirements, production practices, and costs involved in the production of truck crops for fresh market and processing. Information in this report was obtained from 346 producers in Berrien and Van Buren Counties, Mich. The area studied is shown in figure 1.

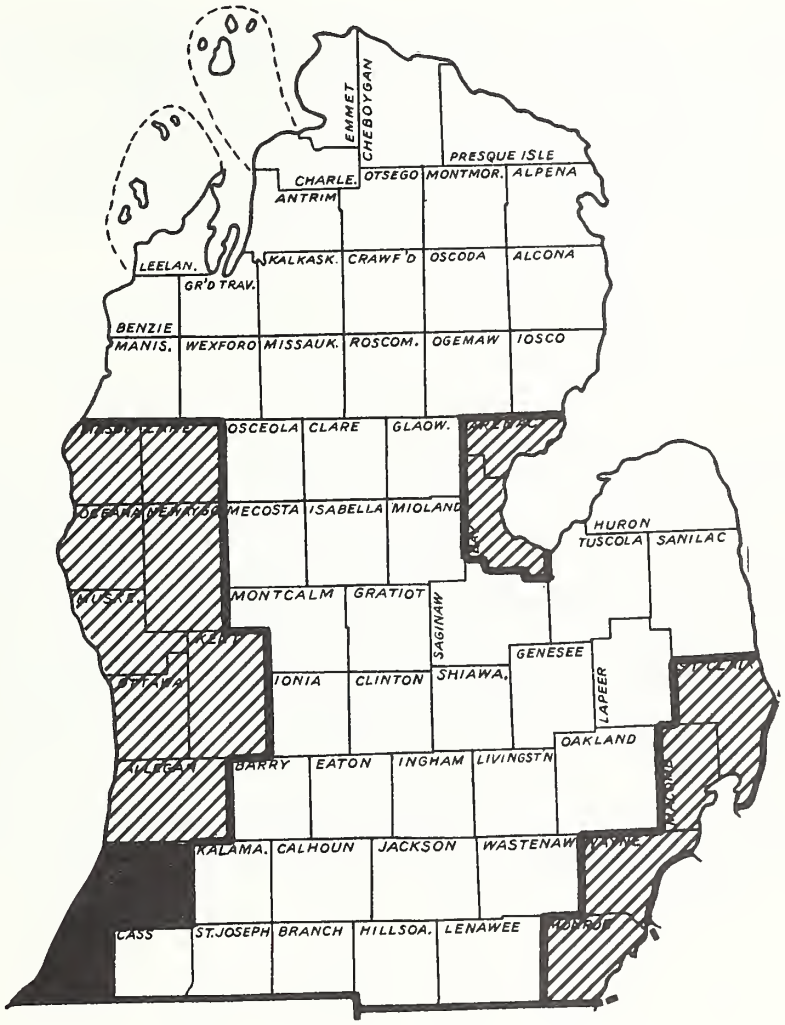
A separate report covering all 12 areas will give information on the extent to which production of truck crops has become vertically coordinated by either ownership or contractual agreements. 4/

2/ The Crossley S-D Surveys, Inc., under U. S. Department of Agriculture, Agricultural Research Service contract #12-14-100-3826 (43) conducted the field survey and made preliminary tabulations. The author is responsible for the analysis of the data.

3/ Based on data cited in footnote 1 as well as the 1958 annual summaries of the same series; also the U. S. Department of Commerce Census of Agriculture, vols. I and II, 1954.

4/ Mighell, Ronald L., Jones, Lawrence A., and Gavett, Earle E. Contract Production of Truck Crops, 12 Selected Areas, United States. ERS-152, U. S. Dept. Agr., March 1964.

LOWER MICHIGAN



Major vegetable-producing counties

Sample counties (Berrien and Van Buren)

Figure 1

CHARACTERISTICS OF BERRIEN AND VAN BUREN COUNTIES, MICHIGAN

Berrien and Van Buren Counties are located in the extreme southwest corner of Michigan. Both counties border on Lake Michigan and the climate is moderated by this great body of water. The length of growing season is the longest in the State, averaging 160-170 days. Soils in the area are on the lighter side and range from sands of low productivity to sandy loams and loams of relatively high productivity. 5/ Fruits, dairy, and truck crops are the major farm enterprises of the area.

In 1963, the truck crop industry in Michigan harvested 113,860 acres of produce valued at $39,301,000. 6/ Growers in Berrien and Van Buren Counties were major contributors to this industry. County data were last available for 1959. In that year these two counties were the location of 25 percent of the State vegetable farms, 16 percent of the harvested acreage of truck crops, and 16 percent of the total value of vegetables produced in Michigan. This area was the locus of nearly three-fourths of the State's asparagus acreage. It was also the major production area for cantaloups, green peppers, tomatoes, and strawberries. 7/

Vegetable production in Berrien and Van Buren Counties was located on 2,308 farms in 1959. Growers harvested $3,121,698 worth of produce from 17,751 acres. Strawberries in the two counties were grown on 3,730 acres on 1,012 farms. 7/

Late in 1959, information regarding the 1959 production of truck crops and strawberries was obtained by interviewing operators of 346 farms. The survey farms represented a 15-percent sample of farms in the two counties harvesting truck crops for sale. On the average, the survey farms had 93.5 acres of cropland. Vegetables and strawberries were grown on 16.1 acres, or 17 percent of the cropland. About 44 percent of the acreage of vegetables was grown for processing. Most of the asparagus acreage was grown for that purpose. More than half of the farms grew only one truck crop. Only about one-fifth of the farms produced three or more of these crops (table 1).

Of the nearly 5,600 acres of truck crops and strawberries grown on the survey farms, almost 1,900 acres were in strawberries--both new and producing beds (table 2).

This report presents information on the production and harvesting of six crops for the fresh market and three grown for processing.

5/ Hill, Elton B., and Mawby, Russell G. Types of Farming in Michigan, Michigan State Col. Spec. Bul. 206, Sept. 1964.

6/ See footnote 1, page 1.

7/ U. S. Department of Commerce. Census of Agriculture, v. 1, pt. 13, 1959.

Table 1.--Sample farms: Number, average acreage of cropland, and distribution of truck crops produced by farms in each size group, Berrien and Van Buren Counties, Mich., 1959

Cropland operated (acres)	Farms in size groups	Average acreage of cropland per farm	Distribution of farms by number of crops produced							
			1	2	3	4	5	6	7	8
	Number	Acres	Farms	Farms	Farms	Farms	Farms	Farms	Farms	Farms
Under 15.0	20	8.0	15	5	---	---	---	---	---	---
15.0 - 29.9	35	20.5	26	8	---	1	---	---	---	---
30.0 - 49.9	67	39.2	46	15	4	1	1	---	---	---
50.0 - 69.9	42	58.5	25	9	7	1	---	---	---	---
70.0 - 99.9	83	81.0	44	20	7	9	1	2	---	---
100.0 - 149.9	34	123.7	14	8	3	3	1	3	1	1
150.0 - 299.9	55	202.7	24	10	8	8	3	1	---	1
300.0 and over	10	432.7	2	2	2	1	3	---	---	---
Total or average	346	93.5	196	77	31	24	9	6	1	2

Table 2.--Truck crops grown for fresh market and for processing on 346 farms, by acreage harvested, Berrien and Van Buren Counties, Mich., 1959

Crop	Farms on which crops were grown for--		Acreage harvested			Average acreage harvested per farm		
	Fresh market	Processing	Fresh market	Processing	Total	Fresh market	Processing	Total
	Number	Number	Acres	Acres	Acres	Acres	Acres	Acres
Asparagus								
Non-producing beds	1	14	2.0	49.0	51.0	2.0	3.5	3.4
Producing beds	8	172	40.8	1,331.3	1,372.1	5.1	7.7	7.7
Cantaloups	38	0	228.0	0	228.0	6.0	0	6.0
Sweet corn	14	0	75.0	0	75.0	5.4	0	5.4
Cucumbers	21	12	125.0	118.0	243.0	6.0	9.8	7.6
Tomatoes	72	94	383.0	684.0	1,067.0	5.3	7.3	7.4
Strawberries 1/								
New beds	116	0	870.1	0	870.1	7.5	0	7.5
Producing beds	117	0	1,015.6	0	1,015.6	8.7	0	8.7
Other 2/	---	---	405.9	239.4	645.3	---	---	---
Total or average	---	---	3,145.4	2,421.7	5,567.1	---	---	16.1

1/ Grown for both fresh market and for processing.
2/ Includes green lima beans, snap beans, cabbage, cauliflower, celery, eggplant, sweet peppers, pumpkin, rhubarb, squash, and watermelons.

VEGETABLES FOR FRESH MARKET

Truck crops are classified as fresh market vegetables if they were intended for this purpose at time of planting and were sold for such at time of harvesting. In this section, all vegetables were grown and harvested for fresh market use.

Asparagus (Non-Producing Beds)

Figure 2 and tables A, B, C, and D present data on the maintenance of young asparagus beds on 42 acres on 11 farms in 1959.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained, but size of equipment used indicates the average tractor to be about a 1- or 2-plow tractor having a drawbar horsepower rating of less than 20.

Asparagus is a perennial vegetable crop. For about 2 years after planting a bed there is no harvesting. Growers must fertilize, spray, and keep weeds under control so that the asparagus roots will grow large and store food for future spear growth. About the fourth year, a nominal cutting is made. Full-scale commercial harvesting begins with the fifth year and continues for the life of the bed. In Michigan, growers indicated the average life of a bed to be about 15 years. Thus, about 11 harvests are made from the average bed.

Inputs were obtained from an insufficient number of growers to report costs of establishing asparagus beds.

The inputs reported here are yearly averages for the second and third years after planting. Hence, cost of producing asparagus should include an establishment cost plus two times the totals of tables A and B divided by the estimated number of harvests (11): For each annual crop of asparagus the materials for maintenance should be $30.20 x 2 years = $60.40 ÷ 11 harvests = $5.49. Labor and power inputs should be pro-rated over the crop harvests and will average 1.7 hours and 1.6 hours, respectively.

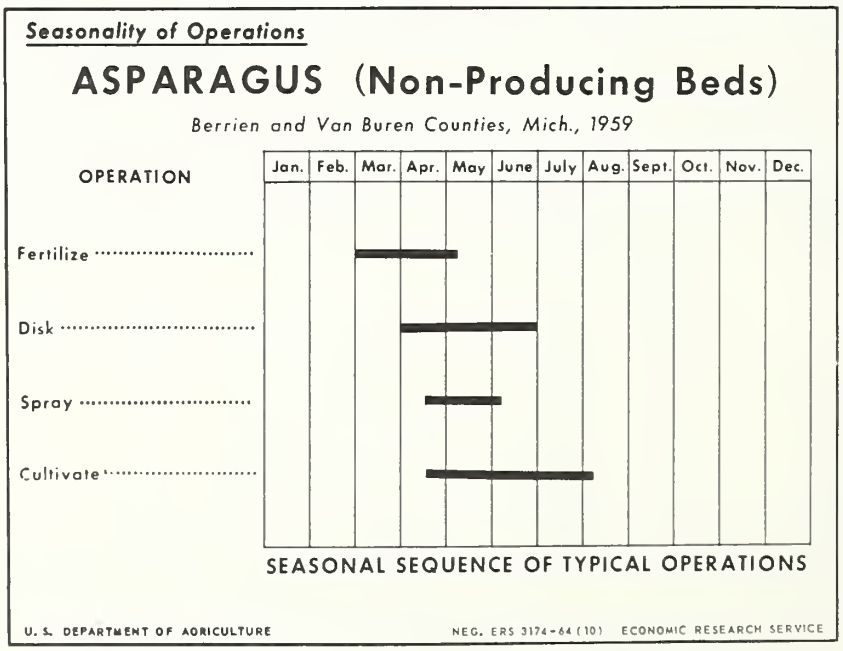


Figure 2

Table A.- Asparagus (non-producing beds): Materials used, averages for 42 acres on 11 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Fertilizer nutrients--						
N	Pound	67.8	1/			
P_2O_5	Pound	89.2	1/	25.01	93	23.26
K_2O	Pound	112.9	1/			
Spray materials	Pound	2.8	2.48	6.94	100	6.94
Total	---	---	---	---	---	30.20

1/ Data not available.

Table B.--Asparagus (non-producing beds): Labor, power, and equipment used by operation, averages for 42 acres on 11 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Fertilize	10-foot spreader	1.3	1.0	1.1	93	1.3	1.0
Disk	8-foot tandem	2.1	2.1	1.9	83	3.3	3.3
Harrow	3-section springtooth	.8	.8	1.4	29	.3	.3
Weed	7-foot rod weeder	1.5	1.5	1.3	7	.1	.1
Drag	7-foot drag	1.0	1.0	1.0	10	.1	.1
Spray	4-row boom sprayer	1.0	.9	1.2	100	1.2	1.1
Cultivate	1-row cultivator	1.6	1.6	3.4	53	2.9	2.9
Total	---	---	---	---	---	9.2	8.8

Table C.--Asparagus (non-producing beds): Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Fertilize	1	1.3	1.0	1.3	1.0
Disk	2	2.1	2.1	4.2	4.2
Spray	1	1.0	.9	1.0	.9
Cultivate	3	1.6	1.6	4.8	4.8
Total	---	---	---	11.3	10.9

Table D.--Asparagus (non-producing beds): Distribution of workers performing specified operations, by type of worker on 11 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory
	Percent	Percent	Percent	Percent
Fertilize	70	20	0	10
Disk	70	20	0	10
Harrow	100	0	0	0
Weed	100	0	0	0
Drag	100	0	0	0
Spray	75	8	0	17
Cultivate	67	0	33	0

Asparagus (Producing Beds)

Figure 3 and tables A, B, C, and D present data covering the growing and harvesting of asparagus for fresh market use on 28 acres on 6 farms in 1959. The average yield per acre was 14.2 hundredweight.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey, but size of equipment used indicates that the average tractor was about a 2-plow tractor with a drawbar horsepower rating of 15 to 20.

After an asparagus bed becomes productive little cultural work is needed. Grass and weeds are the biggest problems, but selective herbicides have been developed and are widely used which provide effective control for grass and weeds. Growers sprayed the acreage at least once for control of grass and weeds and once for control of insects.

In the harvesting operation, each spear is snapped off at the surface of the bed. The spears are placed in baskets or hampers and hauled to a shed for trimming and crating. Inputs for the trimming and crating were not obtained.

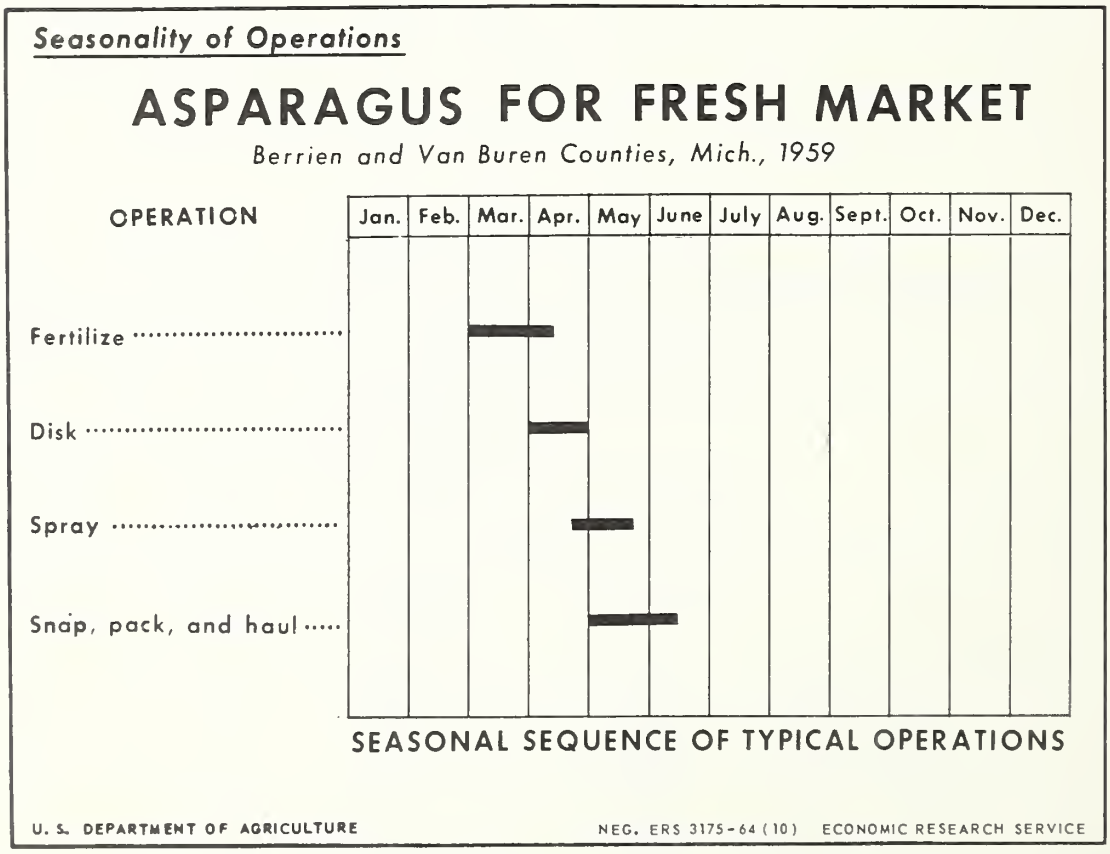


Figure 3

Table A.--Asparagus: Materials used and contract work hired, averages for 28 acres on 6 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Fertilizer nutrients--						
N	Pound	58.2	1/			
P_2O_5	Pound	96.7	1/	26.01	100	26.01
K_2O	Pound	108.1	1/			
Manure	Ton	7.2	4.58	32.98	18	5.94
Spray materials	Pound	2.5	2.91	7.28	100	7.28
Total	---	---	---	---	---	39.23
Contract work hired:						
Spray by boom sprayer; includes materials	Acre	1.0	9.00	9.00	7	.63
Total	---	---	---	---	---	.63
Total materials and contract work	---	---	---	---	---	2/39.86

1/ Data not available.
2/ Average yield per acre--14.2 cwt. Average cost of materials and contract work per cwt.--$2.81, excluding cost of establishment and maintenance prior to years of harvesting.

Table B.--Asparagus: Labor, power, and machinery used in producing and harvesting, averages for 28 acres on 6 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Spread manure	72-bushel spreader	10.4	10.4	1.0	18	1.9	1.9
Fertilize	10-foot spreader	1.0	1.0	1.1	100	1.1	1.1
Disk	7-foot tandem	.8	.8	1.1	100	.9	.9
Drag	7-foot drag	1.0	1.0	7.5	20	1.5	1.5
Spray 1/	4-row boom sprayer	.6	.6	1.8	100	1.1	1.1
Total	---	---	---	---	---	6.5	6.5
Harvest:							
Snap and load by hand, haul by truck	Truck	3.9	.2	30.0	100	117.0	6.0
Total	---	---	---	---	---	117.0	6.0
Total preharvest and harvest	---	---	---	---	---	2/123.5	2/12.5

1/ Includes custom operations.
2/ Average yield per acre--14.2 cwt. Average labor and power used per cwt.--8.70 hours and 0.88 hour, respectively, excluding inputs prior to years of harvesting.

Table C.--Asparagus: Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Fertilize	1	1.0	1.0	1.0	1.0
Disk	1	.8	.8	.8	.8
Spray	2	.6	.6	1.2	1.2
Snap, load, and haul	30	3.9	.2	117.0	6.0
Total	---	---	---	120.0	9.0

Table D.--Asparagus: Distribution of workers performing specified operations, by type of worker on 6 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Domestic migratory	Custom
	Percent	Percent	Percent	Percent
Spread manure	75	25	0	0
Fertilize	83	0	17	0
Disk	83	0	17	0
Drag	100	0	0	0
Spray	67	0	16	17
Snap, load, and haul	45	0	55	0

Cantaloups

Figure 4 and tables A, B, C, and D present data covering the growing and harvesting of cantaloups on 168 acres on 27 farms in 1959. The average yield per acre was 76.0 hundredweight or about 162 bushels.

Tractors were the chief source of power on these farms. Unless otherwise indicated they were used for operations listed. Size of tractor was not obtained in the survey, but size of equipment used indicates the average tractor to be about a 2-plow tractor with a drawbar horsepower rating of 15 to 20.

The majority of cantaloup acreage was planted with homegrown plants. Hotbed operations were conducted by farmers who planted 57 percent of the acreage. Growers purchased plants for 13 percent of the acreage, while 30 percent of the total acres was direct-seeded for late summer production. Hotbed operations took nearly 20 hours per acre of field cantaloups to produce the 1,900 plants that were used in planting. However, even expensive hotbed operations seem advisable compared to paying $70 per thousand plants for those purchased.

Picking, packing, and marketing of cantaloups was on an every-other-day basis and was performed an average of 21.2 times per acre. These operations required 101.8 hours per acre or about 38 minutes per bushel.

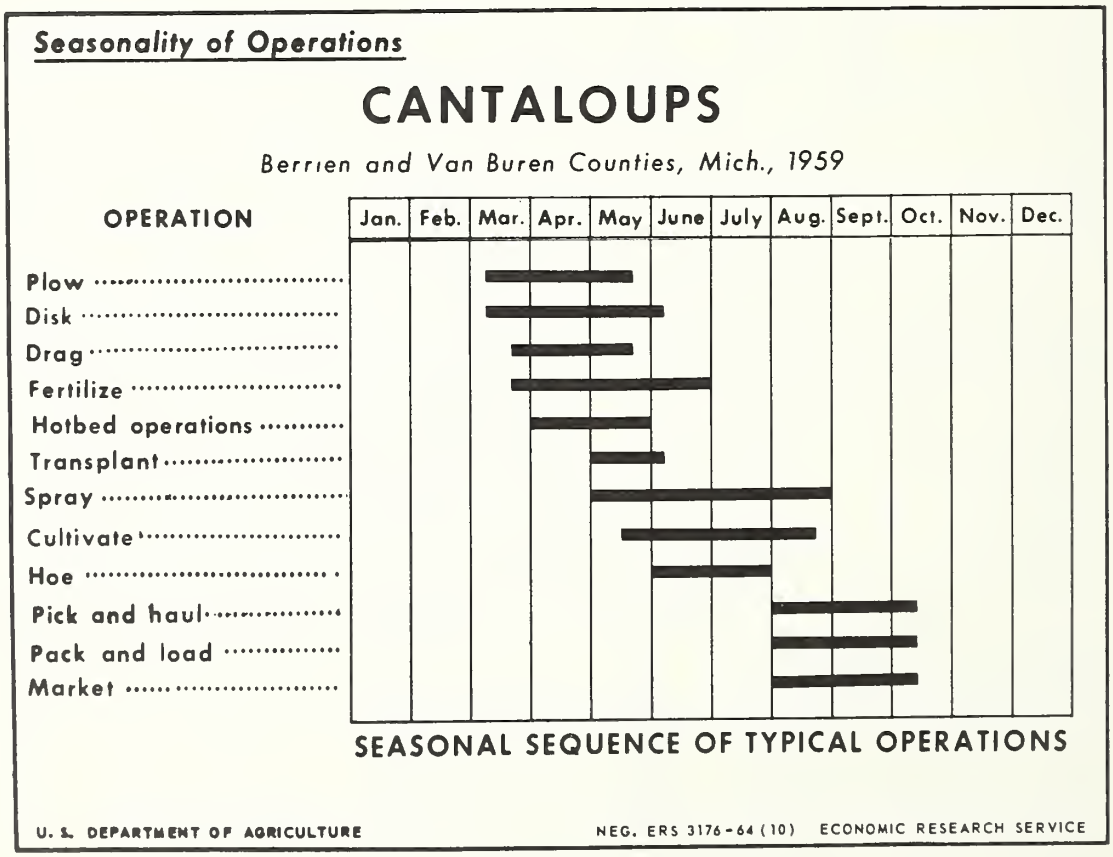


Figure 4

Table A.--Cantaloups: Materials used and contract work hired, averages for 168 acres on 27 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Seed	Pound	1.1	4.20	4.62	87	4.02
Plant bands	Thousand	1.9	5.79	11.00	57	6.27
Compost for hotbeds	Acre 1/	1.0	7.50	7.50	57	4.28
Plastic sash cloth	Acre 1/	1.0	3.20	3.20	12	.38
Plants	Each	2,365.0	.07	165.55	13	21.52
Manure	Ton	8.5	4.51	38.34	30	11.50
Fertilizer nutrients--						
N	Pound	59.7	2/			
P_2O_5	Pound	121.0	2/	29.86	96	28.67
K_2O	Pound	129.5	2/			
Spray materials	Pound	13.4	.68	9.11	83	7.56
Dust materials	Pound	25.0	.10	2.50	6	.15
Containers	Each	182.0	.33	60.06	100	60.06
Total	---	---	---	---	---	144.41
Contract work hired:						
Dust by plane; includes materials	Acre	1.4	11.75	16.45	22	3.62
Total	---	---	---	---	---	3.62
Total materials and contract work	---	---	---	---	---	3/148.03

1/ Per acre of field cantaloups. 2/ Data not available. 3/ Average yield per acre--76.0 cwt. Average cost of materials and contract work per cwt.--$1.95.

Table B.--Cantaloups: Labor, power, and machinery used in producing and harvesting, averages for 168 acres on 27 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Hotbed:1/							
All operations 2/	---	19.6	---	1.0	100	19.6	---
Total	---	---	---	---	---	1/19.6	---
Field (168 acres on 27 farms)							
Preharvest:							
Hotbed operations 1/	---	19.6	---	1.0	57	11.2	---
Spread manure	60-bushel spreader	2.9	1.5	1.0	30	.9	0.4
Plow	2-bot. 14-in. moldbd.	1.6	1.6	1.0	100	1.6	1.6
Disk	7-foot tandem	1.2	1.2	1.1	100	1.3	1.3
Drag	8-foot drag	.7	.7	1.7	96	1.1	1.1
Fertilize	10-foot spreader	1.1	1.0	1.4	82	1.3	1.1
Harrow	8-foot springtooth	1.1	1.1	1.0	8	.1	.1
Furrow	2-row middlebuster	2.3	2.3	1.0	6	.1	.1
Fertilize	---	14.0	---	1.0	27	3.8	---
Mark	2-row marker	.9	.8	1.0	20	.2	.1
Transplant	2-row transplanter	12.1	3.2	1.0	22	2.7	.7
Transplant	---	23.5	---	1.0	48	11.3	---
Plant	2-row planter	1.7	.8	1.0	30	.5	.2
Spray	6-row boom sprayer	.6	.6	3.2	83	1.6	1.6
Dust	---	13.3	---	1.0	6	.8	---
Cultivate	1-row cultivator	1.3	1.3	6.0	100	7.8	7.8
Hoe	---	14.1	---	1.6	100	22.6	---
Turn vines	---	3.6	---	1.4	30	1.5	---
Dust (custom)	Plane	.1	.1	1.4	22	3/	3/
Total	---	---	---	---	---	70.4	16.1
Harvest:							
Pick and haul	Truck	3.3	.3	21.2	100	70.0	6.4
Pack and load	Truck	1.1	.1	21.2	100	23.3	2.1
Market	Truck	.4	.4	21.2	100	8.5	8.5
Total	---	---	---	---	---	101.8	17.0
Total preharvest and harvest	---	---	---	---	---	4/172.2	4/33.1

1/ Area of hotbed not reported, inputs listed are per acre of field cantaloups. 2/ Data obtained were not sufficient to report by individual operations. 3/ Less than 0.05 hour. 4/ Average yield per acre--76.0 cwt. Average labor and power used per cwt.--2.27 hours and 0.44 hour, respectively.

Table C.--Cantaloups: Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Hotbed operations	1	19.6	---	19.6	---
Plow	1	1.6	1.6	1.6	1.6
Disk	1	1.2	1.2	1.2	1.2
Drag	2	.7	.7	1.4	1.4
Fertilize	1	1.1	1.0	1.1	1.0
Transplant by hand	1	23.5	---	23.5	---
Spray	3	.6	.6	1.8	1.8
Cultivate	6	1.3	1.3	7.8	7.8
Hoe	2	14.1	---	28.2	---
Pick and haul	21	3.3	.3	69.3	6.3
Pack and load	21	1.1	.1	23.1	2.1
Market	21	.4	.4	8.4	8.4
Total	---	---	---	187.0	31.6

Table D.--Cantaloups: Distribution of workers performing specified operations, by type of worker on 27 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker					
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory	Foreign	Custom
	Percent	Percent	Percent	Percent	Percent	Percent
Spread manure	72	21	7	0	0	0
Plow	78	18	0	4	0	0
Disk	77	19	0	4	0	0
Drag	77	19	0	4	0	0
Fertilize	63	26	0	11	0	0
Harrow	100	0	0	0	0	0
Furrow	23	0	0	77	0	0
Fertilize by hand	30	0	0	68	2	0
Mark	72	14	14	0	0	0
Transplant	30	0	18	52	0	0
Transplant by hand	12	0	11	69	8	0
Plant	30	0	70	0	0	0
Spray	86	14	0	0	0	0
Dust by hand	0	0	0	100	0	0
Cultivate	75	18	0	7	0	0
Hoe	9	0	13	78	0	0
Turn vines	0	0	0	100	0	0
Dust by plane	0	0	0	0	0	100
Pick and haul	9	0	19	62	10	0
Pack and load	69	7	0	24	0	0
Market	100	0	0	0	0	0

Figure 5 and tables A, B, C, and D present data on the growing and harvesting of sweet corn for fresh market use from 44 acres on 9 farms in 1959. The average yield was 189.7 crates of 5-dozen ears each.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained, but size of equipment used indicates the average tractor to be about a 2-plow tractor with a drawbar horsepower rating of 15 to 20.

The production of sweet corn which is free from earworms and borers requires considerable care and expensive materials. Growers sprayed all their corn acreage an average of 5.3 times. In addition, dust was applied on 7 percent of the acreage. While some of the spray material used was for weed control, most was for the control of the corn earworm, European corn borer, and the fall army worm. The expense of this control averaged more than $11 and 5 hours of labor per acre.

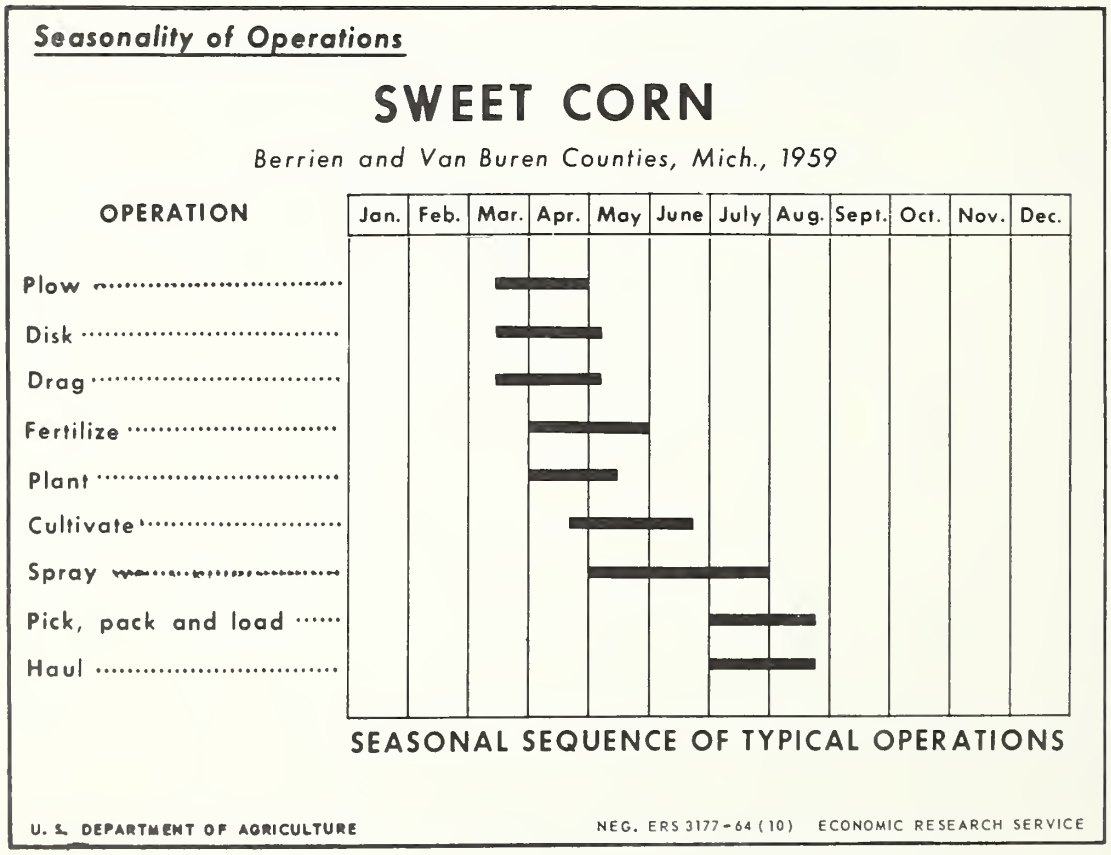


Figure 5

Table A.--Sweet corn: Materials used, averages for 44 acres on 9 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Seed	Pound	9.1	0.59	5.37	100	5.37
Fertilizer nutrients--						
N	Pound	94.8	1/			
P_2O_5	Pound	66.9	1/	22.87	82	18.75
K_2O	Pound	66.9	1/			
Spray materials	Pound	29.6	.38	11.25	100	11.25
Dust	Pound	150.0	.26	39.00	7	2.73
Crates, wirebound (5-dozen)	Each	189.7	.21	39.84	100	39.84
Total	---	---	---	---	---	2/77.94

1/ Data not available.
2/ Average yield per acre--189.7 crates (5-dozen ears). Average cost of materials per crate--$0.41.

Table B.--Sweet corn: Labor, power, and machinery used in producing and harvesting, averages for 44 acres on 9 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Plow	2-bot. 14-in. moldbd.	1.6	1.6	1.0	100	1.6	1.6
Disk	6-foot tandem	1.3	1.3	1.0	84	1.1	1.1
Drag	8-foot drag	1.0	1.0	1.2	70	.8	.8
Fertilize	2-row spreader	1.1	1.1	1.8	82	1.6	1.6
Harrow	8-foot springtooth	2.0	2.0	1.0	16	.3	.3
Plant	4-row cornplanter	1.7	1.6	1.0	100	1.7	1.6
Cultivate	2-row cultivator	1.5	1.5	2.7	100	4.0	4.0
Spray	4-row boom sprayer	1.0	1.0	5.3	100	5.3	5.3
Hoe	---	9.7	---	1.0	20	1.9	---
Dust	4-row duster	.7	.7	3.0	7	.1	.1
Total	---	---	---	---	---	18.4	16.4
Harvest:							
Pick, pack, and load	Truck	4.3	.2	6.9	100	29.7	1.4
Haul to market	Truck	.3	.3	6.9	100	2.1	2.1
Total	---	---	---	---	---	31.8	3.5
Total preharvest and harvest	---	---	---	---	---	1/50.2	1/19.9

1/ Average yield per acre--189.7 crates (5-dozen ears). Average labor and power per crate--0.26 hour and 0.10 hour, respectively.

Table C.--Sweet corn: Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	1.6	1.6	1.6	1.6
Disk	1	1.3	1.3	1.3	1.3
Drag	1	1.0	1.0	1.0	1.0
Fertilize	2	1.1	1.1	2.2	2.2
Plant	1	1.7	1.6	1.7	1.6
Cultivate	3	1.5	1.5	4.5	4.5
Spray	5	1.0	1.0	5.0	5.0
Pick, pack, and load	7	4.3	.2	30.1	1.4
Haul	7	.3	.3	2.1	2.1
Total	---	---	---	49.5	20.7

Table D.- Sweet corn: Distribution of workers performing specified operations, by type of worker on 9 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker				
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory	Foreign
	Percent	Percent	Percent	Percent	Percent
Plow	78	11	0	11	0
Disk	72	0	14	14	0
Drag	67	16	0	17	0
Fertilize	80	20	0	0	0
Harrow	100	0	0	0	0
Plant	80	10	0	10	0
Cultivate	78	11	0	11	0
Spray	90	10	0	0	0
Hoe	17	0	0	83	0
Dust	100	0	0	0	0
Pick, pack, and load	35	0	0	8	57
Haul	100	0	0	0	0

Figure 6 and tables A, B, C, and D present data covering the growing and harvesting of cucumbers for the fresh market from 46 acres on 11 farms in 1959. The average yield per acre was 162.9 bushels or about 84 hundredweight.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained, but size of equipment used indicates the average tractor to be about a 2-plow tractor with a drawbar horsepower rating of 15 to 20.

Most growers planted cucumber seed in the field after danger from frost was past. However, growers of early crop cucumbers set out potted plants. This early crop accounted for 15 percent of the acreage. Growers reported paying from 2 to 10 cents per plant and they set them out at a rate of 2,214 per acre. This made an average plant cost of $155 per acre as compared with only $6.54 for seed for an acre.

Most operations other than hand seeding, hoeing, and harvesting was performed by the farm operator and his family. Hand seeding, hoeing, and picking was performed primarily by domestic migratory workers.

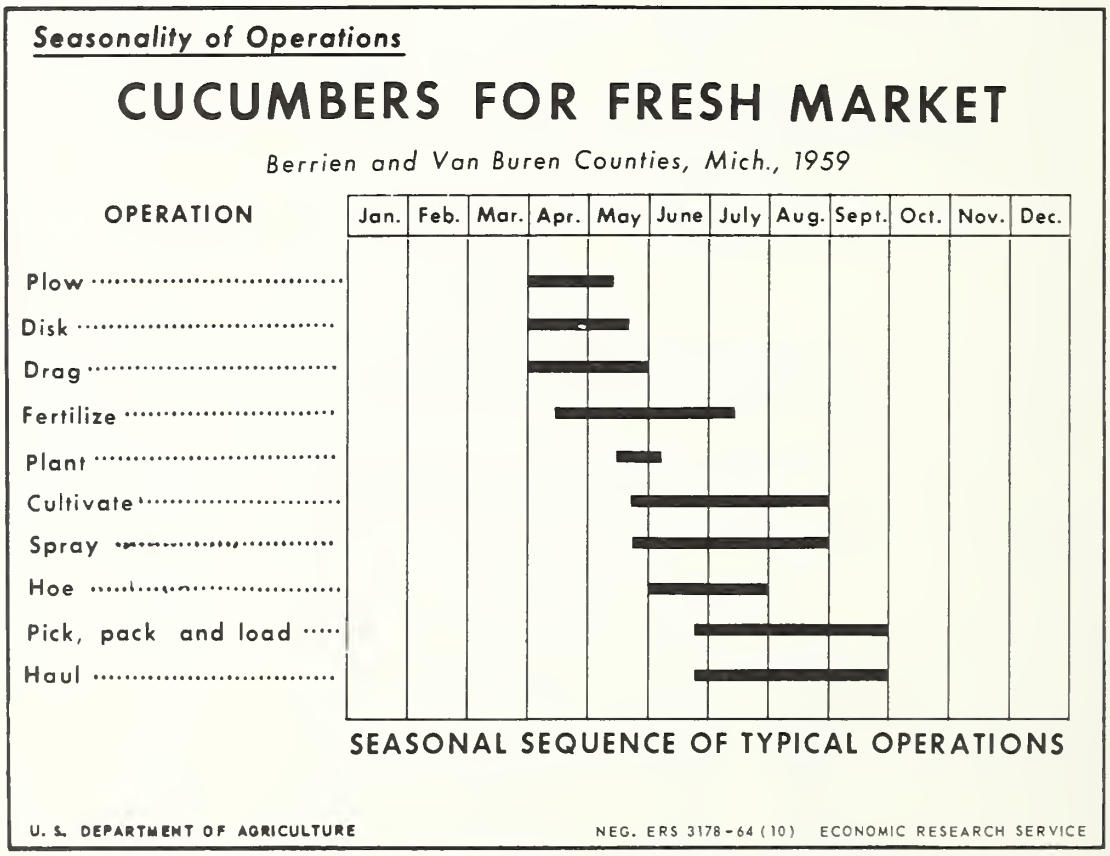


Figure 6

Table A.--Cucumbers: Materials used, averages for 46 acres on 11 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered.	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Seed	Pound	1.9	3.44	6.54	85	5.56
Plants	Each	2,214.0	.07	154.98	15	23.25
Fertilizer nutrients--						
N	Pound	68.9	1/	24.58	94	23.11
P_2O_5	Pound	76.3	1/			
K_2O	Pound	76.3	1/			
Manure	Ton	14.2	4.38	62.20	13	8.09
Spray materials	Pound	1.7	.77	1.31	78	1.02
Dust	Pound	40.0	.20	8.00	11	.88
Baskets, bushel	Each	162.9	.41	66.79	100	66.79
Total	---	---	---	---	---	2/128.70

1/ Data not available.
2/ Average yield per acre--162.9 bushels. Average cost of materials per bushel--$0.79.

Table B.--Cucumbers: Labor, power, and machinery used in producing and harvesting, averages for 46 acres on 11 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Spread manure	90-bushel spreader	8.5	8.5	1.0	13	1.1	1.1
Plow	2-bot. 14-in. moldbd.	1.1	1.1	1.0	100	1.1	1.1
Disk	8-foot tandem	.8	.8	1.3	96	1.0	1.0
Drag	9-foot spiketooth	.8	.8	1.3	100	1.0	1.0
Fertilize	10-foot spreader	1.2	1.2	1.6	76	1.5	1.5
Mark	2-row market	.5	.5	1.0	13	.1	.1
Set transplants	2-row transplanter	11.2	2.6	1.0	15	1.7	.4
Plant	2-row planter	1.0	1.0	1.0	38	.4	.4
Plant	---	15.3	---	1.0	47	7.2	---
Fertilize	---	10.0	---	1.0	2	.2	---
Cultivate	1-row cultivator	1.4	1.4	5.0	89	6.2	6.2
Cultivate and fertilize	1-row cult./attachment	.8	.8	3.1	15	.4	.4
Spray	4-row boom sprayer	.6	.6	4.9	78	2.3	2.3
Hoe	---	17.5	---	3.0	86	45.2	---
Dust	6-row duster	.4	.4	4.0	11	.2	.2
Total	---	---	---	---	---	69.6	15.7
Harvest:							
Pick, pack, and load	Truck	6.6	.1	14.9	100	98.3	1.5
Haul	Truck	.7	.7	14.9	100	10.4	10.4
Total	---	---	---	---	---	108.7	11.9
Total preharvest and harvest	---	---	---	---	---	1/178.3	1/27.6

1/ Average yield per acre--162.9 bushels. Average labor and power used per bushel--1.09 hours and 0.17 hour, respectively.

Table C.--Cucumbers: Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	1.1	1.1	1.1	1.1
Disk	1	.8	.8	.8	.8
Drag	1	.8	.8	.8	.8
Fertilize	2	1.2	1.2	2.4	2.4
Plant	1	1.0	1.0	1.0	1.0
Cultivate	5	1.4	1.4	7.0	7.0
Spray	5	.6	.6	3.0	3.0
Hoe	3	17.5	---	52.5	---
Pick, pack, and load	15	6.6	.1	99.0	1.5
Haul	15	.7	.7	10.5	10.5
Total	---	---	---	178.1	28.1

Table D.--Cucumbers: Distribution of workers performing specified operations, by type of worker on 11 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker				
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory	Foreign
	Percent	Percent	Percent	Percent	Percent
Spread manure	100	0	0	0	0
Plow	82	18	0	0	0
Disk	80	20	0	0	0
Drag	82	18	0	0	0
Fertilize	37	38	0	25	0
Mark	50	50	0	0	0
Set transplants	33	11	34	22	0
Plant by marker	67	33	0	0	0
Plant by hand	20	0	0	80	0
Fertilize by hand	100	0	0	0	0
Cultivate	80	20	0	0	0
Cultivate and fertilize	100	0	0	0	0
Spray	80	10	0	10	0
Hoe	11	0	0	89	0
Dust	100	0	0	0	0
Pick, pack, and load	10	3	7	80	0
Haul	100	0	0	0	0

Tomatoes

Figure 7 and tables A, B, C, and D present data on the growing and harvesting of tomatoes on 292 acres on 62 farms in 1959. The average yield per acre was 110.9 hundredweight.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey, but size of equipment used indicates the average tractor to be about a 2- or 3-plow tractor having a drawbar horsepower rating of 15 to 30.

Growers of 27 percent of the acreage produced their own plants. They purchased seed and some materials and established hotbeds. The direct cost of materials and seed was only slightly less than the cost of purchased plants. Based on data obtained in the survey, labor to set up a hotbed, seed, weed, and transplant into plant bands totaled 25.9 hours per acre or 10.1 hours per thousand plants. It appears that purchased plants would have cost these growers less than their homegrown plants.

The small size of these plantings--about 4.7 acres per farm--helps explain the high labor input per acre. Small acreages require considerably more starting, stopping, and turning time than do large fields. Plowing on these farms with a 2-bottom 14-inch moldboard plow required 2.0 hours per acre; more than twice as much as is used on large fields. Other mechanical operations were equally slow.

Sprinkler irrigation was used on 15 percent of the acreage. Labor inputs were obtained for this operation, but costs of water and pump operation were not ascertained.

In harvesting tomatoes, some growers had workers in the fields every day. Others picked once a week. The most common rate of coverage was once every 3 days.

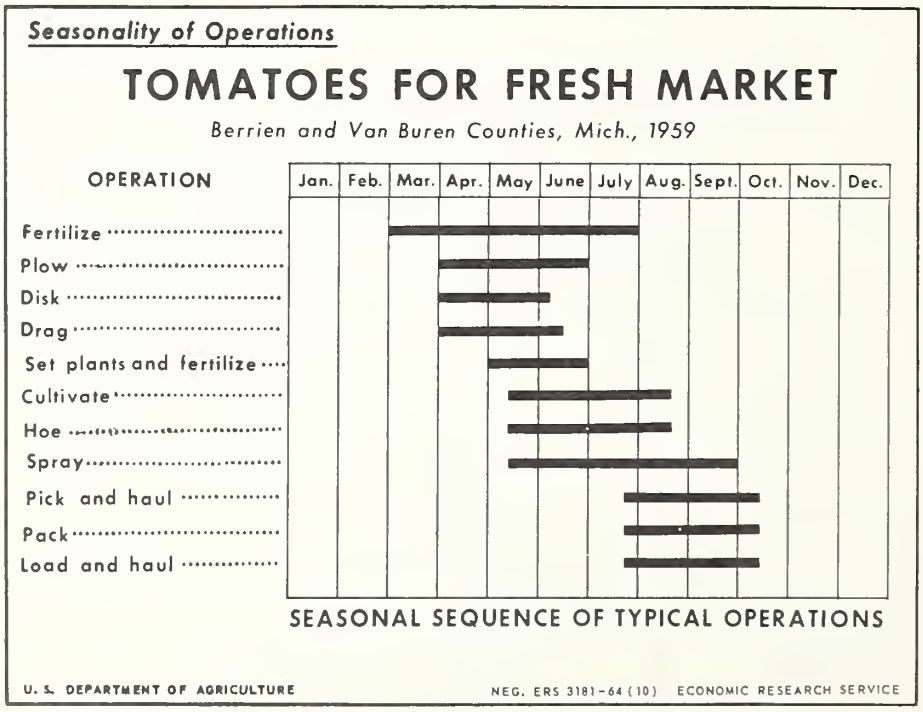


Figure 7

Table A.--Tomatoes: Materials used, averages for 292 acres on 62 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Plants raised 1/	Thousand	2.34	12.16	28.45	27	7.68
Plants purchased	Thousand	2.33	13.57	31.62	73	23.08
Manure	Ton	7.4	4.47	33.08	42	13.89
Fertilizer nutrients--						
N	Pound	67.9	2/	31.02	100	31.02
P_2O_5	Pound	123.0	2/			
K_2O	Pound	127.6	2/			
Lime	Ton	1.5	12.00	18.00	4	.72
Spray materials	Pound	28.4	.65	18.46	98	18.09
Cartons, 10-pound 3/	Each	1,109.0	.15	166.35	100	166.35
Irrigation water	Application	1.9	2/	2/	15	2/
Total	---	---	---	---	---	4/260.83

1/ Includes cost of seed, plant bands, fertilizer, compost, spray, heat, and miscellaneous hotbed materials.
2/ Data not available.
3/ The most common size container used.
4/ Average yield per acre--110.9 cwt. Average cost of materials per cwt.--$2.35.

Table B.--Tomatoes: Labor, power, and machinery used in producing and harvesting, averages for 292 acres on 62 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Hotbed 1/	---	25.9	---	1.0	27	7.0	---
Spread manure	70-bushel spreader	2.1	1.7	1.0	42	.9	0.7
Fertilize	10-foot sower	1.6	.9	1.0	82	1.3	.7
Lime	10-foot sower	2.1	1.7	1.0	4	.1	.1
Plow	2-bot. 14-in. moldbd.	2.0	2.0	1.0	98	2.0	2.0
Disk	7-foot tandem	1.1	1.1	1.0	81	.9	.9
Drag	9-foot drag harrow	.9	.9	1.4	76	1.0	1.0
Mark	15-foot marker	1.0	.9	1.0	16	.2	.1
Mark	---	2.8	---	1.0	2	.1	---
Set plants and fertilize	1-row planter/attach.	15.1	4.1	1.0	75	11.3	3.1
Set plants	---	30.6	---	1.0	25	7.6	---
Fertilize	---	7.6	---	1.1	20	1.7	---
Cultivate	1-row cultivator	2.0	2.0	5.5	100	11.0	11.0
Hoe	---	9.8	---	1.6	75	11.8	---
Spray	6-row boom sprayer	1.0	1.0	5.1	98	5.0	5.0
Irrigate	---	3.1	---	1.9	15	.9	---
Total	---	---	---	---	---	62.8	24.6
Harvest:							
Pick and haul	Truck	9.6	.2	18.2	100	174.7	3.6
Pack	---	6.7	---	18.2	100	121.9	---
Load and haul	Truck	.5	.5	18.2	100	9.1	9.1
Total	---	---	---	---	---	305.7	12.7
Total preharvest and harvest	---	---	---	---	---	2/368.5	2/37.3

1/ All labor incurred in producing homegrown plants. 2/ Average yield per acre--110.9 cwt. Average labor and power used per cwt.--3.32 hours and 0.34 hour, respectively.

Table C.--Tomatoes: Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Fertilize	1	1.6	0.9	1.6	0.9
Plow	1	2.0	2.0	2.0	2.0
Disk	1	1.1	1.1	1.1	1.1
Drag	1	.9	.9	.9	.9
Set plants and fertilize	1	15.1	4.1	15.1	4.1
Cultivate	6	2.0	2.0	12.0	12.0
Hoe	2	9.8	---	19.6	---
Spray	5	1.0	1.0	5.0	5.0
Pick and haul	18	9.6	.2	172.8	3.6
Pack	18	6.7	---	120.6	---
Load and haul	18	.5	.5	9.0	9.0
Total	---	---	---	359.7	38.6

Table D.--Tomatoes: Distribution of workers performing specified operations, by type of worker on 62 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory
	Percent	Percent	Percent	Percent
Hotbed 1/	63	7	0	30
Spread manure	62	33	0	5
Fertilize	68	6	0	26
Lime	100	0	0	0
Plow	83	11	0	6
Disk	83	11	0	6
Drag	86	7	0	7
Mark	70	20	0	10
Mark by hand	0	100	0	0
Set plants and fertilize	53	6	0	41
Set plants by hand	49	1	20	30
Fertilize by hand	50	11	2	37
Cultivate	87	7	0	6
Hoe	32	0	6	62
Spray	88	9	0	3
Irrigate	72	11	0	17
Pick and haul	17	0	10	73
Pack	31	14	42	13
Load and haul	100	0	0	0

1/ Includes all operations in producing plants.

Strawberries (New Beds)

Figure 8 and tables A, B, C, and D present data covering the establishment of 843 acres of new strawberry beds on 111 farms in 1959. There was no production from this acreage.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained, but size of equipment used indicates that the average tractor was a 2-plow tractor and had a drawbar horsepower rating of 15 to 20.

Strawberry plants are grown as annuals, biennials, and perennials depending upon climatic conditions of the producing areas. In Michigan, strawberries are grown as perennials. The average life of strawberry plantings is estimated at 3 years--the establishment year and 2 crop years. Inputs for establishment should be prorated over 2 crop years.

Most of the labor involved in establishing a new strawberry planting is used on weed control. Hoeing and weeding, an operation that was performed an average of 6.3 times, required 130.4 hours per acre. Cultivating was done an average of 10 times per acre and used a total of 23 hours. These two operations combined used 84 percent of the labor spent on establishing strawberries.

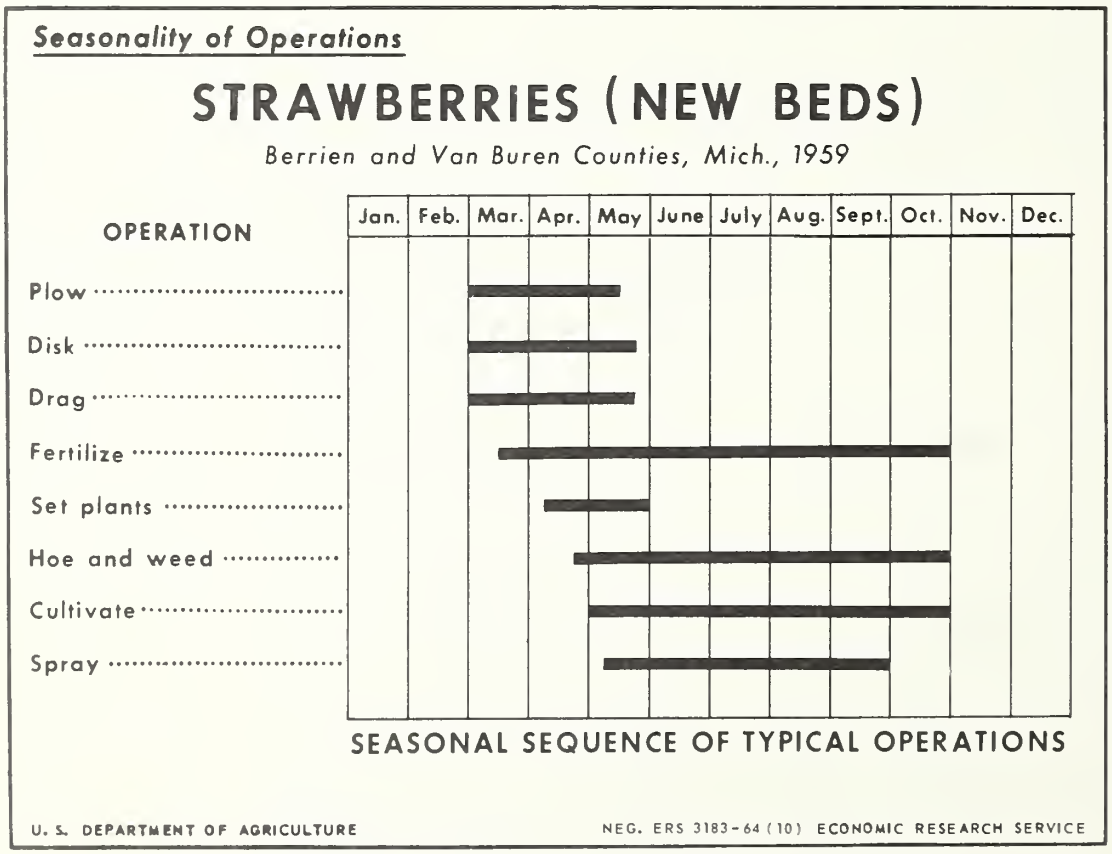


Figure 8

Table A.--Strawberries (new beds): Materials used, averages for 843 acres on 111 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Plants	Thousand	5.3	14.14	74.92	100	74.92
Cow manure	Ton	10.2	4.65	47.43	28	13.28
Plant starter	Pound	4.2	.25	1.05	88	.92
Spray materials	Application	2.7	5.12	13.82	60	8.29
Fertilizer nutrients--						
N	Pound	68.1	1/			
P_2O_5	Pound	137.4	1/	31.18	99	30.87
K_2O	Pound	91.6	1/			
Mulch, straw	Ton	2.0	23.27	46.54	5	2.33
Total	---	---	---	---	---	2/130.61

1/ Data not available.
2/ Estimated life of the new beds is 3 years (2 crops). Average cost of materials per acre, per crop--$65.30.

Table B.--Strawberries (new beds): Labor, power, and machinery used in producing, averages for 843 acres on 111 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Spread manure	72-bushel spreader	5.1	4.0	1.0	28	1.4	1.1
Plow	2-bot. 14-in. moldbd.	1.8	1.8	1.0	100	1.8	1.8
Disk	10-foot single disk	1.0	1.0	1.3	100	1.3	1.3
Drag	10-foot drag	.9	.9	1.3	98	1.1	1.1
Fertilize	1-row side dresser	3.6	1.7	2.4	98	8.5	4.0
Fertilize	---	10.2	---	1.0	1	.1	---
Set plants 1/	1-row transplanter/ attachment	12.9	3.7	1.0	99	12.8	3.7
Set plants	---	25.8	---	1.0	1	.3	---
Hoe and weed	---	22.5	---	6.3	92	130.4	---
Cultivate	1-row cultivator	2.3	2.3	10.0	100	23.0	23.0
Spray	4-row boom sprayer	.9	.9	4.0	60	2.2	2.2
Mulch	Straw spreader	3.8	1.9	1.0	5	.2	.1
Total	---	---	---	---	---	2/183.1	2/38.3

1/ Plant starter solution was applied on 88 percent of the acreage at the time plants were set.
2/ Estimated life of the new beds is 3 years (2 crops). Labor and power used per acre, per crop--91.6 hours and 19.2 hours, respectively.

Table C.--Strawberries (new beds): Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	1.8	1.8	1.8	1.8
Disk	1	1.0	1.0	1.0	1.0
Drag	1	.9	.9	.9	.9
Fertilize	2	3.6	1.7	7.2	3.4
Set plants	1	12.9	3.7	12.9	3.7
Hoe and weed	6	22.5	---	135.0	---
Cultivate	10	2.3	2.3	23.0	23.0
Spray	4	.9	.9	3.6	3.6
Total	---	---	---	185.4	37.4

Table D.--Strawberries (new beds): Distribution of workers performing specified operations, by type of worker on 111 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory
	Percent	Percent	Percent	Percent
Spread manure	75	14	0	11
Plow	71	17	2	10
Disk	70	18	1	11
Drag	69	18	2	11
Fertilize	50	11	3	36
Fertilize by hand	100	0	0	0
Set plants and fertilize	39	10	9	42
Set plants by hand	88	6	6	0
Hoe and weed	7	3	1	89
Cultivate	70	14	1	15
Spray	81	9	2	8
Mulch	64	9	0	27

Strawberries (Producing Beds)

Figure 9 and tables A, B, C, and D present data covering the production and harvesting of strawberries for fresh market and for processing on 769 acres on 91 farms in 1959. The average yield per acre was 6,528 pounds of which 635 pounds were capped for processing.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained, but size of equipment used indicates the average tractor was about a 2-plow tractor with a drawbar rating of 15 to 20 horsepower.

Maintenance of an established strawberry bed took more than 38 hours per acre. Hoeing and weeding accounted for about half of this amount.

The main use of labor on strawberries is in the harvesting. This task averaged 607.6 hours per acre. Most of the production was harvested for fresh market use, but on 20 percent of the acreage, strawberries were also harvested for processing use. The berries going to processors were capped in the field--thus, labor per hundredweight is higher for picking berries for processing than for those picked for fresh market.

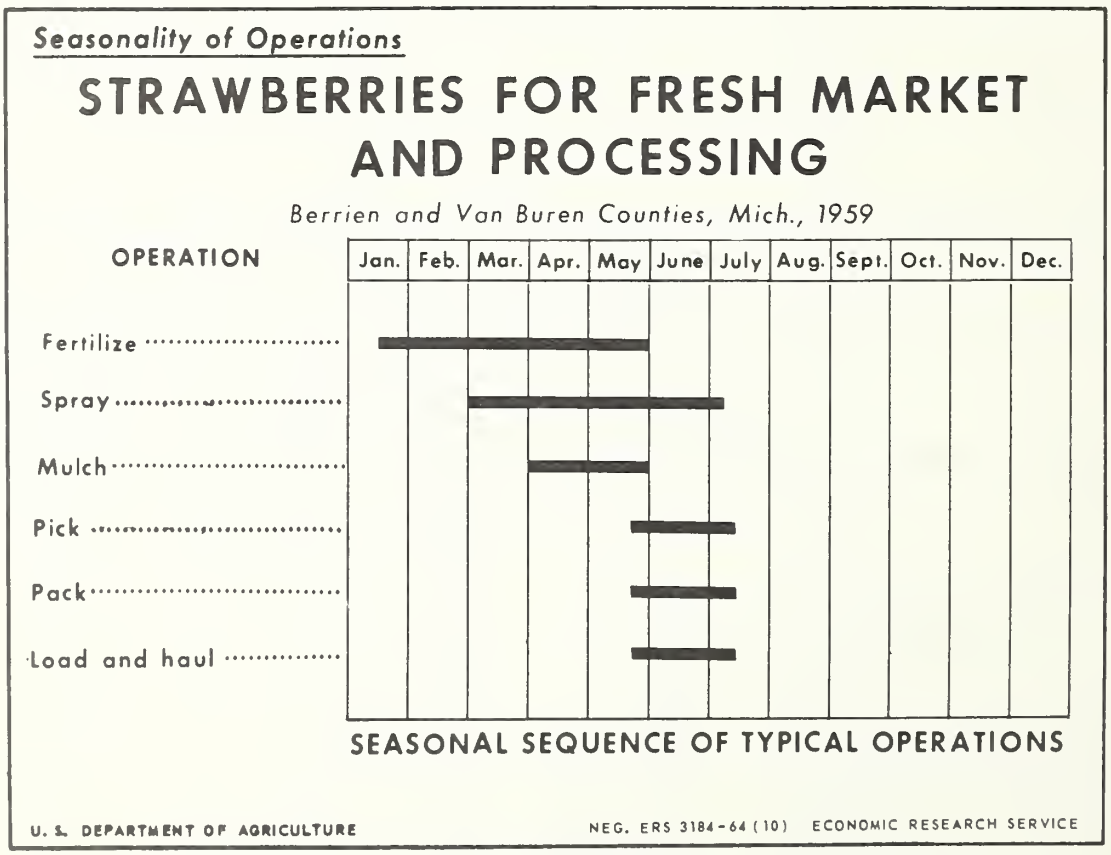


Figure 9

Table A.--Strawberries: Materials used and contract work hired, averages for 769 acres on 91 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Materials used:						
Mulch, straw	Ton	2.1	23.50	49.35	67	33.06
Fertilizer nutrients--						
N	Pound	69.3	1/			
P_2O_5	Pound	144.8	1/	30.66	53	16.25
K_2O	Pound	100.7	1/			
Spray materials	Pound	18.5	.82	15.17	83	12.59
Containers, 16-quart crates 2/	Each	24.5	.68	166.60	100	166.60
Total	---	---	---	---	---	228.50
Contract work hired:						
Dust by plane, includes dust--	Application	2.4	6.64	15.94	16	2.55
Total	---	---	---	---	---	2.55
Total materials and contract work	---	---	---	---	---	231.05
Pro-rata share of establishment costs 3/	---	---	---	---	---	65.13
Total	---	---	---	---	---	4/296.18

1/ Data not available. 2/ Containers for an average of 635 pounds per acre were provided by processors. 3/ Cost of establishing beds was pro-rated over 2 crops. 4/ Average yield per acre--6,528 pounds. Average cost of materials and contract work per cwt.--$4.54.

Table B.--Strawberries: Labor, power, and machinery used in producing and harvesting, averages for 769 acres on 91 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Fertilize	1-row distributor	1.9	1.7	1.3	53	1.3	1.2
Cultivate	1-row cultivator	1.8	1.8	3.8	19	1.3	1.3
Spray	2-row sprayer	.8	.8	3.9	83	2.6	2.6
Hoe and weed	---	18.7	---	3.1	32	18.6	---
Mulch	Mulch spreader	6.7	2.3	1.0	69	4.6	1.6
Mulch	---	30.7	---	1.0	15	4.6	---
Set pipes	Tractor and trailer	6.8	---	1.0	29	2.0	---
Irrigate 1/	Sprinkler system	2.0	---	5.5	29	3.2	---
Dust (custom)	Plane	2/	2/	2.4	16	2/	2/
Total	---	---	---	---	---	38.2	6.7
Harvest:							
For fresh market 3/							
Pick	---	45.7	---	10.1	100	461.6	---
Pack	---	4.4	---	10.1	100	44.4	---
Load and haul	Truck	.9	.6	10.1	100	9.1	6.1
Total	---	---	---	---	---	515.1	6.1
For processing 4/							
Pick and cap	---	48.2	---	9.3	20	89.7	---
Load and haul	Truck	1.5	.4	9.3	20	2.8	.6
Total	---	---	---	---	---	92.5	.6
Total harvest	---	---	---	---	---	607.6	6.7
Total preharvest and harvest	---	---	---	---	---	645.8	13.4
Pro-rata share of establishment 5/	---	---	---	---	---	91.4	19.0
Total	---	---	---	---	---	6/737.2	6/32.4

1/ Includes some sprinkling for frost protection. 2/ Less than 0.05 hour. 3/ An average of approximately 5,893 pounds per acre were picked for fresh market. 4/ Approximately 4,350 pounds per acre on 157 acres were harvested for processing. 5/ Labor and power used in establishing the beds were pro-rated over 2 crops. 6/ Average yield per acre--6,528 pounds. Average labor and power used per cwt.--11.3 hours and 0.5 hour, respectively.

Table C.- Strawberries: Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Pro-rata share of establishing beds1/	1	91.4	19.0	91.4	19.0
Fertilize	1	1.9	1.7	1.9	1.7
Spray	4	.8	.8	3.2	3.2
Mulch	1	6.7	2.3	6.7	2.3
Pick	10.1	45.7	---	461.6	---
Pack	10.1	4.4	---	44.4	---
Load and haul	10.1	.9	.6	9.1	6.1
Total	---	---	---	618.3	32.3

1/ The labor and power inputs were pro-rated over 2 crops.

Table D.--Strawberries: Distribution of workers performing specified operations, by type of worker on 91 farms, Berrien and Van Buren Counties, Mich., 1959

Operation1/	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory
	Percent	Percent	Percent	Percent
Fertilize	72	12	3	13
Cultivate	88	12	0	0
Spray	82	8	4	6
Hoe and weed	11	0	0	89
Mulch	56	16	5	23
Mulch by hand	43	0	7	50
Set pipes	50	0	50	0
Irrigate	20	9	9	62
Harvest:				
Fresh market				
Pick	1	0	1	98
Pack	67	33	0	0
Load and haul	100	0	0	0
Processing				
Pick and cap	1	0	2	97
Load and haul	40	0	40	20

1/ Excludes contract work.

VEGETABLES FOR PROCESSING

This section contains production and harvesting data on three important processing crops--asparagus, cucumbers, and tomatoes. While some production of asparagus and tomatoes was sold for the fresh market, inputs reported here are for only that portion of the crop that was processed.

Asparagus

Figure 10 and tables A, B, C, and D present data covering the growing and harvesting of asparagus for processing from 1,284 acres on 167 farms in 1959. The average yield per acre was 16.6 hundredweight.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey, but size of equipment used indicates the average tractor to be about a 2-plow tractor having a drawbar horsepower rating of 15 to 20.

The growing of asparagus for fresh market is similar to that for processing. In Michigan, unlike other areas, the harvest is essentially the same. The spears are snapped for both fresh and processing. Less time is spent per hundredweight for harvesting the processing crop as pickers exercise less care than with a product destined for the fresh market.

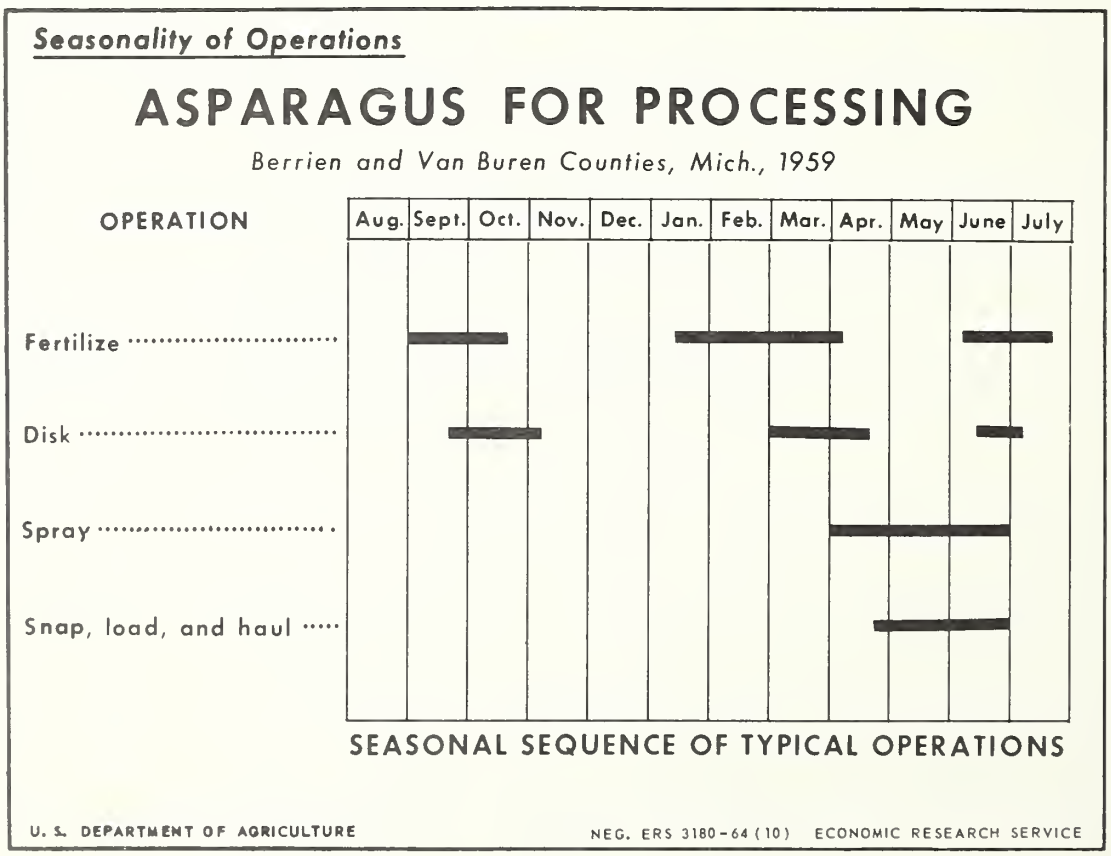


Figure 10

Table A.--Asparagus: Materials used, averages for 1,284 acres on 167 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Manure	Ton	4.1	4.37	17.92	11	1.97
Lime	Ton	1.3	3.00	3.90	2	.08
Fertilizer nutrients--						
N	Pound	98.7	1/			
P_2O_5	Pound	104.7	1/	32.61	94	30.65
K_2O	Pound	126.2	1/			
Spray materials	Pound	6.5	1.34	8.71	95	8.27
Total	---	---	---	---	---	2/40.97

1/ Data not available.

2/ Average yield per acre--16.6 cwt. Average cost of materials used per cwt.--$2.47, excluding establishment and maintenance.

Table B.--Asparagus: Labor, power, and machinery used in producing and harvesting, averages for 1,284 acres on 167 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Fertilize	10-foot spreader	0.9	0.8	1.3	94	1.1	1.0
Disk	6-foot tandem	.9	.9	2.5	100	2.2	2.2
Spread manure	72-bushel spreader	2.1	2.1	1.6	11	.4	.4
Spread lime	10-foot spreader	1.0	1.0	1.0	2	1/	1/
Chop tops	6-foot rotary	1.2	1.2	1.0	10	.1	.1
Drag	7-foot drag	.8	.8	1.4	47	.5	.5
Spray	4-row boom sprayer	.6	.5	2.1	95	1.2	1.0
Cultivate	1-row cultivator	.9	.9	5.4	5	.2	.2
Total	---	---	---	---	---	5.7	5.4
Harvest:							
Snap and load by hand, haul by truck	Truck	3.6	.2	28.9	90	93.6	5.2
Snap by machine 2/	4-row carrier	2.4	1.6	37.5	10	9.0	6.0
Haul by truck	Truck	.2	.2	37.5	10	.8	.8
Total	---	---	---	---	---	103.4	12.0
Total preharvest and harvest	---	---	---	---	---	3/109.1	3/17.4

1/ Less than 0.05 hour.
2/ Workers ride on a 4-row motorized personnel carrier and snap spears by hand.
3/ Average yield per acre--16.6 cwt. Average labor and power used per cwt.--6.57 hours and 1.05 hours, respectively.

Table C.--Asparagus: Usual labor and power inputs, Berrien and Van Buren Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Fertilize	1	0.9	0.8	0.9	0.8
Disk	2	.9	.9	1.8	1.8
Spray	2	.6	.5	1.2	1.0
Snap, load, and haul	29	3.6	.2	104.4	5.8
Total	---	---	---	108.3	9.4

Table D.--Asparagus: Distribution of workers performing specified operations, by type of worker on 167 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory
	Percent	Percent	Percent	Percent
Fertilize	79	10	7	4
Disk	85	7	4	4
Spread manure	85	4	7	4
Spread lime	50	0	0	50
Chop tops	87	13	0	0
Drag	83	7	4	6
Spray	83	8	4	5
Cultivate	60	0	40	0
Snap and load by hand, haul by truck	26	2	25	47
Snap by machine	2	3	10	85
Haul by truck	92	3	5	0

Cucumbers

Figure 11 and tables A, B, C, and D present data covering the growing and harvesting of cucumbers for pickles on 86 acres on 10 farms in 1959. The average yield per acre was 207.5 bushels or 99.6 hundredweight.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained, but size of equipment used indicates that the average tractor was about a 2-plow tractor having a drawbar horsepower rating of 15 to 20.

Most preharvest operations on cucumbers were performed by machine, yet hand work in seeding, hoeing, thinning, and fertilizing amounted to more than half the total preharvest labor inputs.

Harvesting is the big task requiring over 110 hours per acre. Michigan growers generally rely upon migratory or foreign workers to harvest their cucumbers. On these farms, migratory and foreign workers (Mexican Nationals) made up 80 percent of the harvest labor force. Wage rates for picking cucumbers were not obtained, workers usually receive half the crop for picking it.

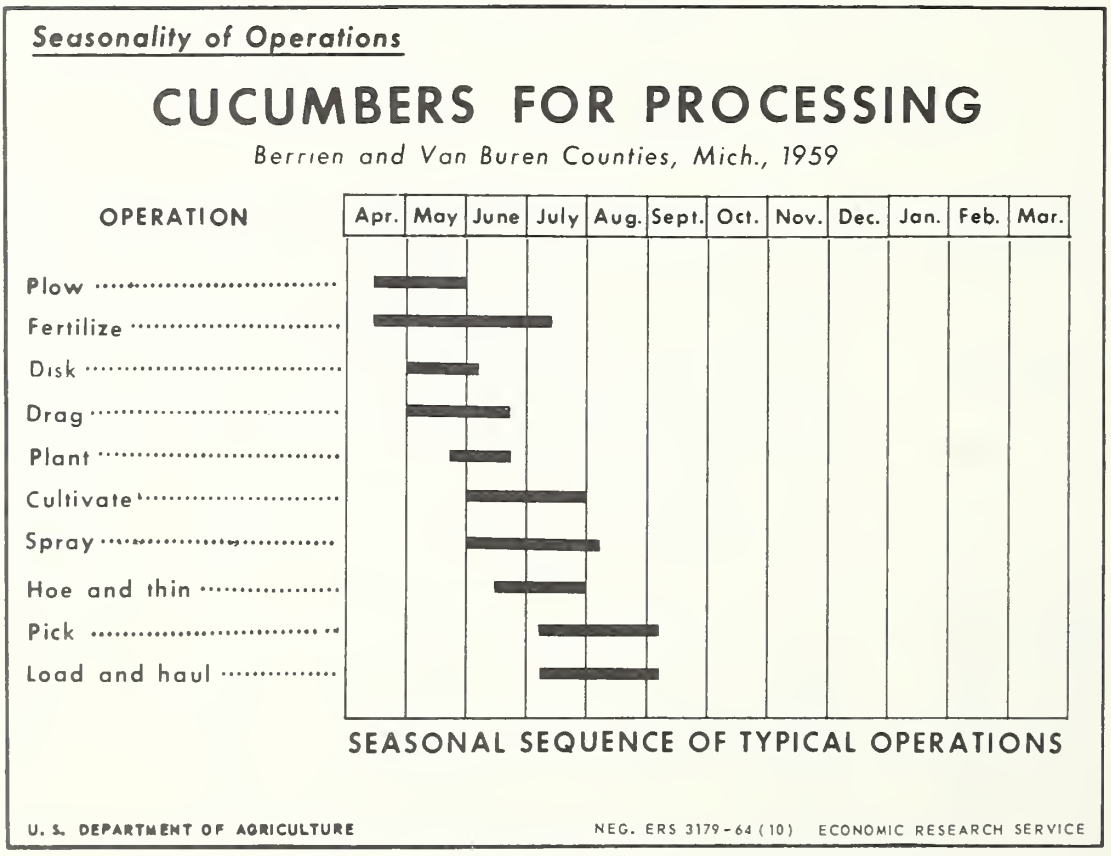


Figure 11

Table A.--Cucumbers: Materials used, averages for 86 acres on 10 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Seed	Pound	1.6	1.20	1.92	100	1.92
Fertilizer nutrients--						
N	Pound	41.1	1/	19.01	100	19.01
P_2O_5	Pound	84.9	1/			
K_2O	Pound	85.5	1/			
Spray materials	Application	5.8	2.68	15.54	57	8.86
Dust materials	Pound	20.0	.32	6.40	23	1.47
Sacks	Each	240.0	.10	24.00	2/15	3.60
Total	---	---	---	---	---	3/34.86

1/ Data not available.
2/ Sacks for production on the remaining acreage were provided by the processor.
3/ Average yield per acre--99.6 cwt. Average cost of materials used per cwt.--$0.35.

Table B.--Cucumbers: Labor, power, and machinery used for producing and harvesting, averages for 86 acres on 10 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Plow	2-bot. 14-in. moldbd.	1.3	1.3	1.0	100	1.3	1.3
Fertilize	10-foot spreader	1.2	1.2	1.2	95	1.3	1.3
Disk	8-foot tandem	.7	.7	1.6	91	1.0	1.0
Drag	11-foot drag	.7	.7	1.5	84	.9	.9
Cultipack	6-foot cultipacker	.8	.8	1.0	16	.1	.1
Plant	2-row planter	1.6	1.1	1.0	91	1.5	1.0
Plant	---	18.0	---	1.0	9	1.6	---
Cultivate	1-row cultivator	1.5	1.5	2.8	85	3.6	3.6
Spray	6-row boom sprayer	.5	.5	5.8	57	1.7	1.7
Cultivate and fertilize	1-row cult./attach.	1.0	1.0	1.0	10	.1	.1
Thin and weed	---	6.2	---	1.0	19	1.2	---
Hoe and thin	---	12.9	---	1.1	52	7.4	---
Fertilize	---	4.6	---	1.0	4	.2	---
Dust	6-row duster	.2	.2	1.0	23	1/	1/
Total	---	---	---	---	---	21.9	11.0
Harvest:							
Pick	---	6.5	---	16.9	100	109.8	---
Load and haul	Truck	.2	.2	16.9	100	3.4	3.4
Total	---	---	---	---	---	113.2	3.4
Total preharvest and harvest	---	---	---	---	---	2/135.1	2/14.4

1/ Less than 0.05 hour.
2/ Average yield per acre--99.6 cwt. Average labor and power used per cwt.--1.36 hours and 0.14 hour, respectively.

Table C.--Cucumbers: Usual labor and power inputs, Berrien and Van Buren, Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	1.3	1.3	1.3	1.3
Fertilize	1	1.2	1.2	1.2	1.2
Disk	2	.7	.7	1.4	1.4
Drag	2	.7	.7	1.4	1.4
Plant	1	1.6	1.1	1.6	1.1
Cultivate	3	1.5	1.5	4.5	4.5
Spray	6	.5	.5	3.0	3.0
Hoe and thin	1	12.9	---	12.9	---
Pick	17	6.5	---	110.5	---
Load and haul	17	.2	.2	3.4	3.4
Total	---	---	---	141.2	17.3

Table D.--Cucumbers: Distribution of workers performing specified operations, by type of worker on 10 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker				
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory	Foreign
	Percent	Percent	Percent	Percent	Percent
Plow	80	0	20	0	0
Fertilize	75	0	25	0	0
Fertilize by hand	100	0	0	0	0
Disk	78	0	22	0	0
Drag	71	0	29	0	0
Cultipack	100	0	0	0	0
Plant	73	9	18	0	0
Plant by hand	100	0	0	0	0
Cultivate	88	12	0	0	0
Spray	67	0	33	0	0
Cultivate and fertilize	100	0	0	0	0
Thin and weed	100	0	0	0	0
Hoe and thin	62	0	38	0	0
Dust	100	0	0	0	0
Pick	15	0	5	13	67
Load and haul	60	0	40	0	0

Tomatoes

Figure 12 and tables A, B, C, and D cover production of tomatoes for processing from 546 acres on 84 farms in 1959. The average yield was 8.11 tons per acre.

Tractors were the chief source of power on these farms. Unless otherwise indicated, they were used for operations listed. Size of tractor was not obtained in the survey. But, from the size of equipment drawn by the tractors, it is assumed that the average tractor was a 2- or 3-plow unit with a drawbar rating of 20 to 30 horsepower.

The production of tomatoes for processing required nearly 20 hours of labor per ton. Most of this labor was used for hand harvesting. On the average, growers had their acreage picked a total of 6.6 times during the 2-month harvesting period of Aug. 1 to Sept. 30. Domestic migratory workers comprised 75 percent of the picking force. They were paid piece rates which averaged 13.7 cents per 30-pound lug and ranged from 9 to 18 cents.

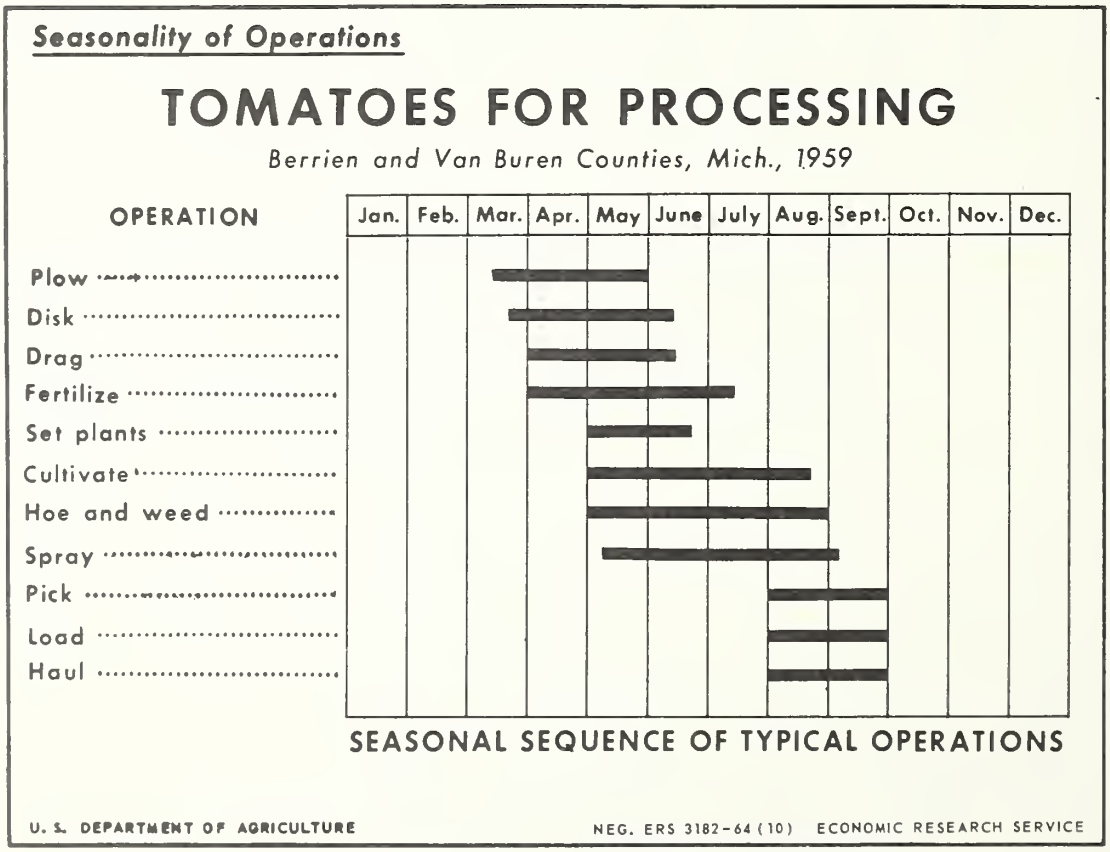


Figure 12

Table A.--Tomatoes: Materials used, averages for 546 acres on 84 farms, Berrien and Van Buren Counties, Mich., 1959

Item	Unit	Units per acre covered	Price per unit	Cost per acre covered	Percentage of total acreage covered	Cost per acre, total acreage
		Number	Dollars	Dollars	Percent	Dollars
Plants	Thousand	2.7	6.83	18.44	100	18.44
Plant starter	Pound	4.3	.25	1.08	48	.52
Cow manure	Ton	6.2	4.52	28.02	13	3.64
Fertilizer nutrients--						
N	Pound	54.6	1/	26.53	99	26.26
P_2O_5	Pound	115.4	1/			
K_2O	Pound	117.6	1/			
Spray materials	Application	6.3	4.03	25.39	99	25.14
Total	---	---	---	---	---	2/74.00

1/ Data not available.
2/ Average yield per acre--8.11 tons. Average cost of materials used per ton--$9.12.

Table B.--Tomatoes: Labor, power, and machinery used in producing and harvesting, averages for 546 acres on 84 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type and size of equipment	Time per acre, once over		Times over, acreage covered	Percentage of total acreage covered	Time per acre, total acreage	
		Man	Power			Man	Power
		Hours	Hours	Number	Percent	Hours	Hours
Preharvest:							
Spread manure	70-bushel spreader	2.2	1.4	1.0	13	0.3	0.2
Plow	2-bot. 14-in. moldbd.	1.8	1.8	1.0	100	1.8	1.8
Disk	7-foot tandem	1.0	1.0	1.3	98	1.3	1.3
Drag	9-foot drag	.9	.9	1.3	94	1.1	1.1
Fertilize	1-row spreader	3.6	1.9	2.1	94	7.1	3.8
Float	10-foot float	.6	.6	1.0	4	1/	1/
Set plants 2/	1-row planter/attach.	9.4	2.9	1.0	84	7.9	2.4
Set plants	---	27.4	---	1.0	16	4.4	---
Cultivate	1-row cultivator	1.6	1.6	5.7	97	8.8	8.8
Cultivate and fertilize	1-row cult./attach.	1.4	1.4	1.0	5	.1	.1
Fertilize	---	7.4	---	1.0	4	.3	---
Hoe and weed	---	13.8	---	1.8	65	16.1	---
Spray	6-row boom sprayer	.7	.7	6.3	99	4.4	4.4
Total	---	---	---	---	---	53.6	23.9
Harvest:							
Pick	---	14.3	---	6.6	100	94.4	---
Load	Truck	1.6	.4	6.6	100	10.6	2.6
Haul	Truck	.2	.2	6.6	100	1.3	1.3
Total	---	---	---	---	---	106.3	3.9
Total preharvest and harvest	---	---	---	---	---	3/159.9	3/27.8

1/ Less than 0.05 hour. 2/ Includes applying plant starter on 48 percent of the acreage. 3/ Average yield per acre--8.11 tons. Average labor and power used per ton--19.72 hours and 3.43 hours, respectively.

Table C.--Tomatoes: Usual labor and power inputs, Berrien and Van Buren, Counties, Mich., 1959

Operation	Times over	Time per acre, once over		Time per acre, total	
		Man	Power	Man	Power
	Number	Hours	Hours	Hours	Hours
Plow	1	1.8	1.8	1.8	1.8
Disk	1	1.0	1.0	1.0	1.0
Drag	1	.9	.9	.9	.9
Fertilize	2	3.6	1.9	7.2	3.8
Set plants	1	9.4	2.9	9.4	2.9
Cultivate	6	1.6	1.6	9.6	9.6
Hoe and weed	2	13.8	---	27.6	---
Spray	6	.7	.7	4.2	4.2
Pick	6.6	14.3	---	94.4	---
Load	6.6	1.6	.4	10.6	2.6
Haul	6.6	.2	.2	1.3	1.3
Total	---	---	---	168.0	28.1

Table D.--Tomatoes: Distribution of workers performing specified operations, by type of worker on 84 farms, Berrien and Van Buren Counties, Mich., 1959

Operation	Type of worker			
	Operator and unpaid family	Year-round hired	Local seasonal	Domestic migratory
	Percent	Percent	Percent	Percent
Spread manure	75	8	0	17
Plow	84	5	4	7
Disk	84	5	4	7
Drag	85	4	3	8
Fertilize	68	3	2	27
Float	0	0	0	100
Set plants	46	5	4	45
Set plants by hand	60	0	0	40
Cultivate	83	3	2	12
Cultivate and fertilize	100	0	0	0
Fertilize	91	0	0	9
Hoe and weed	24	0	10	66
Spray	85	5	2	8
Pick	10	2	13	75
Load	46	0	46	8
Haul	60	10	0	30

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